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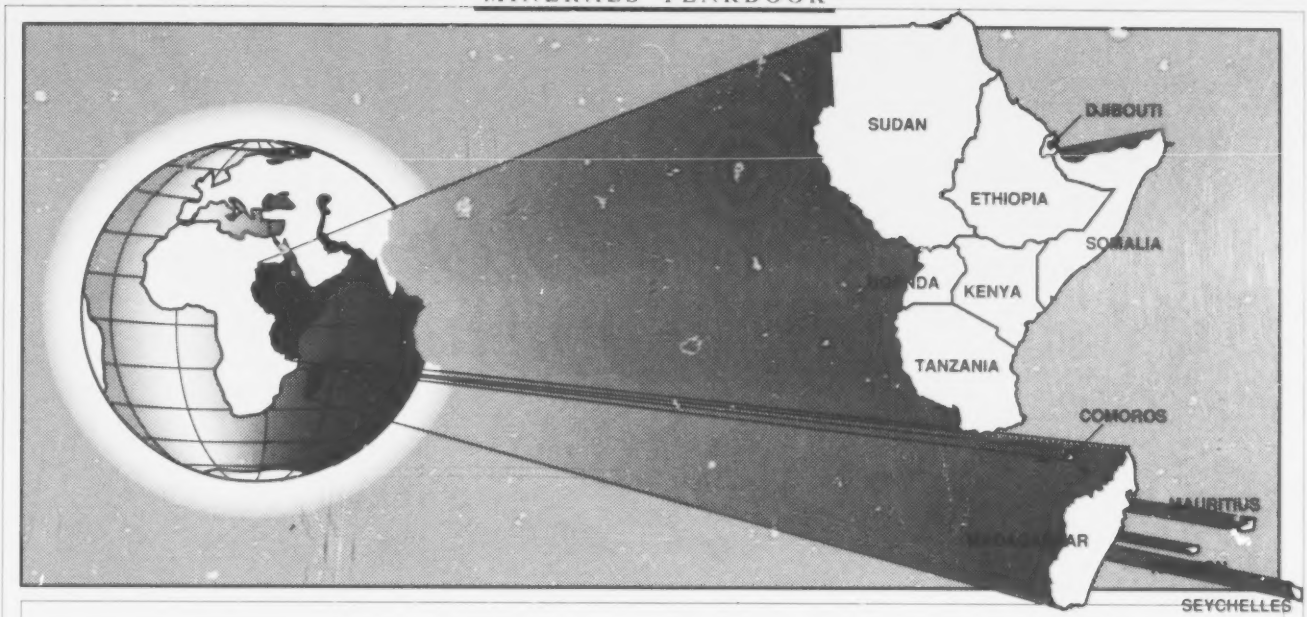

THE MINERAL INDUSTRIES OF

EAST AFRICA AND THE INDIAN OCEAN

By Lloyd E. Antonides, Thomas P. Dolley, Harold R. Newman, John G. Panulas, George A. Rabchevsky, and Walter G. Steblez

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BUREAU OF MINES

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U.S.
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Secretary

BUREAU OF
MINES

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Director

1988

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COMOROS[1]

Comoros is made up of several islands with poor transportation links, increasing population, and few natural resources. Agriculture, including fishing and forestry, the leading sector of the economy, contributed about 40% to the gross domestic product (GDP), employed about 80% of the labor force, and provided most of the exports. Despite major investments in the tourist industry, which accounted for about 25% of GDP, economic growth has stagnated since 1983. Commercially exploitable mineral deposits on the islands of the Comoros archipelago were limited to small sand and gravel quarries, which were operated for local construction needs.

DJIBOUTI[2]

Saudi Arabia and France continued the financial assistance that had started upon the country's independence from France in June 1977. Saudi Arabia funded the construction of the country's first roadway between the capital city, Djibouti, and Tajoura in the north. There has been almost no foreign private investment and little domestic private investment since independence. The largest manufacturing enterprises were state-owned: a dairy, a mineral water bottler, and a livestock feed processor. All petroleum product requirements were also imported. Live animals were Djibouti's largest export, primarily to Saudi Arabia and the Yemens.

Mineral production was limited to the exploitation of small sand and gravel deposits for domestic construction, evaporated salt, and a small amount of lime. A salt evaporation pan was operated in the salt marshes of Todoura. Limestone was mined in Mangadafo, supplying a lime kiln in the town of Dorale. Most of the country's electricity was generated by the diesel-run electric powerplant. Electricité du Djibouti, state-owned, continued working on a geothermal research center to assess the feasibility of incorporating geothermal power into its grid, thereby cutting oil imports.

ETHIOPIA[3]

The 1988 economy declined, largely caused by another drought, military setbacks, decline in coffee prices, and Government policies. Real GDP decreased by 2%, while the population grew by 3%. The small, but important, mining and quarrying sector grew by 20%. Agriculture continued to be the main factor in the economy, contributing 40% of GDP, 85% of exports, and about 80% of employment. The United States and the Federal Republic of Germany continued to be Ethiopia's largest export markets. Coffee accounted for about 71% of total Ethiopian exports to the United States.

Small amounts of gold, gypsum, kaolin clay, limestone, marble, platinum, and salt were mined. Mining of cesium and columbium also was planned. Gold was the major mineral export in terms of value. The placer gold deposits of the Adola area, in the Sidamo region, about 470 kilometers south-southeast of Addis Ababa, were mined at the production rate of about 400 kilograms per year. The construction of facilities for the Lega Dembi gold mine near Shakiso in Jemjem Province, in the Sidamo region, about 500 kilometers south of Addis Ababa, was 50% completed. The project was expected to start production in 1989. Reportedly, the roads linking the mine to the nearby towns were constructed. The capacity of the mine was to be 96,000 troy ounces of gold per year. The facilities included a 3,000-ton-per-day cyanide leach section and associated processing plant. The project was jointly financed by the African Development Bank, the European Investment Bank, and the Ethiopian Government.

An iron ore deposit, estimated at 18 million tons, was discussed in the Welega Province, western Ethiopia. A tantalum deposit was discovered near Shakiso. Ethiopia had large deposits of bentonite, reserves of 31 million tons of diatomite, and large quantities of soda ash. Smaller deposits included copper, feldspar, graphite, lignite coal, mica, nickel, potash, pyrite, sulfur, talc, and a variety of gem stones. Potash, mostly sylvinite, occurred in the Danakil Depression in Tigre Province and was reportedly being redeveloped as an open pit, with Libyan help. There were also substantial resources of carnallite.

The Assab Oil Refinery, the only petroleum refinery in Ethiopia, used imported crude as feedstock. A gas discovery was made in the arid Ogaden region bordering Somalia.

Loans were made by the Czechoslovakian Government in October for the development of Ethiopian mining and energy resources, among other projects. A 2-year protocol agreement on economic, scientific, and technical cooperation was signed with Cuba on October 28. An agreement was signed with Italy on October 17 to alleviate the shortage of foreign exchange aid to purchase the products needed for various economic development sectors. The funds from the Italian Government will be used for buying raw materials and chemicals for industry, construction, transportation, and other economic sectors. A joint-venture company was reportedly set up with Libya to begin the construction of a marble, granite, and limestone plant. The plant will be located about 225 kilometers east of Addis Ababa.

TABLE 1

ETHIOPIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2 3]		1984	1985	1986	1987[p]	1988[e]
Cement, hydraulic[e]		240,000	250,000	250,000	250,000	250,000
Gold, mine output, Au content	troy ounces	[e]20,000	[e]25,000	29,675	20,649	[4]23,414
Gypsum and anhydrite, crude		[r]700	[r]700	850	1,400	[4]1,900
Lime		[e]2,000	[e]2,100	2,200	2,300	[4]3,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	[e r]800	[r]852	913	1,436	1,173
Jet fuel	do.	380	403	418	531	482
Kerosene	do.	20	22	64	130	117
Distillate fuel oil	do.	[e]1,500	2,149	1,484	1,913	1,535
Residual fuel oil	do.	[e]2,000	[r]1,365	2,051	2,381	2,157
Liquefied petroleum gas	do.	50	58	69	138	103
Other[5]	do.	[r]700	[r]660	526	612	379
Total including refinery fuel and losses	**do.**	**5,450**	**[r]5,509**	**5,525**	**7,141**	**5,946**
Platinum, mine output, Pt content	troy ounces	[e r]50	[e r]50	77	33	[r]48
Pumice		[e]6,000	15,000	35,481	26,042	[4]143,442
Salt:[e]						
Rock		15,000	15,000	15,000	15,000	15,000
Marine		120,000	120,000	120,000	120,000	120,000
Stone, sand and gravel:						
Limestone[e]	thousand tons	100	100	100	75	[4]145
Sand[e]	do.	520	530	550	680	[4]990
Other[e]	do.	1,100	1,100	1,030	1,150	[4]1,320

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Includes data available through Feb. 20, 1990.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] Data are for year ending June 30 of year stated.

[4] Reported figure.

[5] Includes refinery fuel and losses through 1985. Starting with 1986, refinery fuel and losses are included in output of individual products.

KENYA[4]

Major activity in Kenya's mining sector occurred predominantly in its cement and soda ash industries. Kenya's two major cement producers were Bamburi Portland Cement Co. and East African Portland Cement Co., producing 970,000 tons per year and 330,000 tons per year, respectively. A third cement works was scheduled for construction over a 3-year period at West Pokot in the Rift Valley Province. The $98 million facility was to have a capacity of 300,000 tons per year of cement; the bulk of that tonnage was slated for export to Uganda.

Kenya's economic performance in 1988 was markedly better than in 1987, primarily as a result of higher coffee and tea prices, trade liberalization, and effective monetary management policies. The real GDP grew by 5.2% in 1988, compared with 4.8% in 1987, and 5.5% in 1986. New job creation increased by 5.4% over 1987.

Magadi Soda Co. produced about 220,000 tons of soda ash at its Lake Magadi trona operation. Owned by ICI Chemical and Polymeers Ltd. of the United Kingdom, the company also produced just over 40% of the country's crude salt, with an output of nearly 40,000 metric tons.

Production of blue sapphire continued at the Garba-Tula Mine. Sapphire extracted from a new deposit north of Lodner and west of Lake Turkana was determined to contain an unspecified amount of heat-treatable geuda, and cabochon material that produced sharp 6-ray or 12-ray stars.

Ruby prospecting was undertaken near Amboseli National Park in the Kajiado district. Preliminary samples

TABLE 2

KENYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
Barite		210	255	420	50	[r]48
Carbon dioxide, natural gas		3,161	3,151	4,093	4,386	[3]5,182
Cement, hydraulic	thousand tons	1,164	847	1,312	1,321	[3]1,239
Clays, kaolin		295	320	2,000	40	[3]42
Diatomite		1,512	3,082	1,450	616	[3]712
Feldspar		685	692	—	—	[3]—
Fluorspar (acid grade)		46,578	58,174	50,851	60,190	[3]99,000
Gem stones, precious and semiprecious:						
Amethyst	kilograms	17	10	([4])	([4])	([4])
Aquamarine	do.	7	7	([4])	([4])	[3]97
Garnet	do.	107	87	44	408	[3]835
Iolite	do.	23	24	20	20	20
Ruby	do.	187	92	66	70	[3]1,420
Tourmaline	do.	13	31	5	11	[3]23
Gold, mine output, Au content	troy ounces	600	442	2,339	8,939	[3]546
Gypsum and anhydrite		[e]1,500	[e]1,500	11,060	38,819	[3]37,965
Iron and steel: Steel, crude[e]		10,000	10,000	10,000	10,000	10,000
Kyanite[e]		1	1	1	1	1
Lime		20,855	27,860	12,300	26,482	[3]27,326
Magnesium compounds: Magnesite[e]		[3]311,254	300,000	300,000	[r]—	[3]—
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	267	253	303	304	300
Gasoline	do.	2,594	2,722	2,832	2,869	2,900
Jet fuel and kerosene	do.	2,822	2,775	3,095	3,261	3,300
Distillate fuel oil	do.	3,496	3,719	3,916	4,333	4,400
Residual fuel oil	do.	5,064	4,310	4,234	4,178	4,200
Other[5]	do.	680	687	721	844	900
Total including refinery fuel and losses	**do.**	**14,923**	**14,466**	**15,101**	**15,789**	**16,000**
Phosphatic materials: Guano		6	6	—	—	[3]—
Salt:						
Crude, rock		72,885	66,330	[r,e]91,000	[r]72,000	[3]94,682
Refined		28,000	25,800	35,379	[r,e]28,000	37,000
Sodium compounds, n.e.s.:						
Soda ash (sodium carbonate)		226,050	227,760	237,650	228,650	[3]220,000
Soda, crushed, raw		5,288	5,441	5,882	1,557	[3]—
Stone, sand and gravel:						
Calcareous:						
Coral[e]	thousand tons	[r]1,186	[r]1,200	[r]1,200	[r]1,331	[3]1,352
Limestone	do.	1,444	1,333	2,069	400	[3]416
Sand, glass		[r]95	[r]100	255	[e]250	250
Shale		789,484	750,000	750,000	142,428	143,000
Vermiculite		872	1,515	2,544	3,887	[r]3,707
Wollastonite		—	—	298	—	[3]—

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Less than 1/2 unit.

[5]Includes refinery fuel and losses through 1985. Starting in 1986, refinery fuel and losses are included in output of individual products.

collected included small rubies of high quality. Ruby and tsavorite mining within the boundaries of the national game park was suspended by the Government in October after it was discovered that poachers, hunting rhinoceros and elephants, were disguising themselves as miners to escape detection. Tsavorite is a green gem variety of grossular garnet found only in Kenya.

MADAGASCAR[5]

Mineral industry production in Madagascar showed only slight improvement in 1988. Total revenues from all exports were $284 million of which mineral commodities contributed only 3%. Economic problems included inflation and the devaluation of the Madagascar franc (FMG) relative to the United States dollar, with the exchange rate more than doubled since 1986. The major mineral commodities produced were chromite, graphite, mica, and precious and semiprecious stones. Development of Madagascar's titanium-bearing ilmenite sands continued to show potential for becoming the nation's single largest foreign exchange earner. Proposed levels of investment for this mining project were approximately $250 million[6] for mining operations and $150 million for the necessary infrastructure development. Infrastructure needed for the project included roads, a 20-megawatt electricity generating plant and an ore bulk-loading terminal. Funding for the titanium mining project would be subsidized by the World Bank with other potential backers being the African Development Bank and the European Development Bank.

Government Policies and Programs

A World Bank credit worth $100 million allowed the Government of Madagascar to agree to an introduction of an open general license (OGL), or flexible exchange rate system in mid-1988. The OGL economic reform plan allowed open market forces to determine for the first time in Madagascar the value of the FMG. World Bank support would be reinforced by additional credits from France and the United States. These actions were planned to stimulate economic development following the Government's 71% overall devaluation of the FMG in 1987. This provided impetus to the export sector, bringing the overvalued FMG closer to a realistic rate of exchange. On December 26, 1988, France and Madagascar signed two agreements worth $14.2 million and $1.1 million, respectively. The first agreement was for the rehabilitation of Malagasy banks and the second was for the supply of telecommunications equipment. Additionally, the Federal Republic of Germany cancelled Madagascar's debts to it amounting to approximately $710,000.

Madagascar's Office Militaire National pour les Industries Strategiques (OMNIS) was the state company for the minerals sector. During 1988, OMNIS requested financing for a feasibility study from the U.S. Trade and Development Program (USTDP) for a ferrochrome project. Subsequently, the USTDP approved a $500,000 grant for the ferrochrome project feasibility study.

Production and Trade

Chromite production in Madagascar, modest by world standards, came principally from an open pit mining operation in Andriamena, operated by the Malagasy parastatal Kraomita. An additional open pit chromite mine was owned by Kraomita and was in Ranomena. Total production output of chromite ore was 107,307 metric tons yielding 64,177 metric tons of marketable concentrate. Chromite ore production capacity for Madagascar was estimated at between 300,000 and 500,000 metric tons per year. Madagascar exported an estimated 90% of its chromite to France and Japan.

Small-scale mining of precious and semiprecious stones yielded approximately 490,000 kilograms. Piezoelectric quartz, used in the electronics industry, yielded 153 kilograms.

In July, Madagascar received the last shipment of approximately 350,000 barrels of crude oil from the U.S.S.R. The Government's contract with the U.S.S.R. for shipments of crude oil was suspended due to payment arrears. According to officials of Solima, the parastatal that managed petroleum importation, refining, and distribution, the World Bank financed Madagascar's crude oil purchased in November and December. The total shipment for both months was approximately 700,000 barrels of oil. In September, Madagascar imported approximately 350,000 barrels of crude oil from Iran. At yearend, the Government was searching for additional sources to finance the roughly 350,000 barrels of imported crude oil needed to forestall shortages into 1989.

Mica production yielded approximately 617 metric tons, more than 215 metric tons greater than 1987 production figures but less than one-half the amount mined in 1986. Malagasy mica was generally found as very large sheets in pegmatites and was valuable because of its use as an electrical insulator.

Total export revenues declined by approximately $26.6 million from the 1987 total of $310.7 million. The drop in export revenue in 1988 was mainly attributed to the falling prices of Madagascar's important export crops, cloves and coffee.

Commodity Review

***Metals.*—Gold.**—Gold mining in Madagascar at the turn of the 19th century approached 64,000 troy ounces per year. By comparison, production increased by over 44% to 2,894 troy ounces of gold in 1988, primarily due to contract work by the French agency Bureau de Recherches Géologiques et Minières (BRGM) and OMNIS. Production was augmented by BRGM operating a lightweight gold dredge in

TABLE 3

MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986[e]	1987[p]	1988
METALS						
Beryllium: Beryl in quartz concentrates, industrial and ornamental	kilograms	[3]46	50	50	[3]35	3
Chromium: Chromite concentrate, gross weight		59,765	127,415	[3]82,910	[3]106,600	64,177
Gold, mine output, Au content[e]	troy ounces	130	130	130	[3]1,289	2,894
Rare-earth minerals: Bastnasite[e]	kilograms	25,000	9,000	10,000	10,000	10,000
INDUSTRIAL MINERALS						
Abrasives, natural: (industrial only)[e]	kilograms	10,000	10,000	10,000	10,000	10,000
Cement, hydraulic[e]		35,000	35,000	35,000	35,000	35,000
Clay, kaolin		[e]2,500	6,367	6,000	[3]1,427	365
Feldspar[e]	kilograms	1,800	[3]5,195	5,000	5,000	5,000
Gem stones:						
Amazonite	do.	6,162	5,519	5,500	[3]3,783	525
Amethyst:						
Gem	do.	10	11	10	[3]11	1,700
Geodes[e]	do.	[3]4,300	[3]8,550	9,000	9,000	9,000
Citrine	do.	46	372	400	[3]6	112
Cordierite	do.	10	762	800	[3]387	886
Garnet	do.	2,603	1,201	1,500	1,500	6
Tourmaline	do.	2,000	2,000	2,000	2,000	2,367
Graphite, all grades		13,973	13,971	[3]16,187	[3]13,169	14,106
Mica, phlogopite:						
Block		26	25	100	[3]25	5
Scrap		623	500	1,300	[3]300	605
Splittings and sheet		71	64	194	[3]77	8
Total		**720**	**589**	**[3]1,594**	**[3]402**	**618**
Ornamental stones:						
Agate	kilograms	9,300	8,042	8,000	[3]14,034	13,886
Apatite	do.	3,500	3,500	3,500	[3]1,948	2,090
Aragonite		809	991	1,000	[3]500	[e]500
Calcite		1,584	1,160	1,000	[3]2,934	12
Celestite	kilograms	30,000	29,974	30,000	[3]4,365	34,511
Jasper	do.	16,425	16,300	16,000	[3]19,730	21,030
Labradorite	do.	2,740	14,821	15,000	[3]24,320	27,748
Other gem and ornamental[e]		150	200	250	250	[e]250
Quartz:						
Crystal	kilograms	32,467	32,500	32,500	32,500	22,136
Geodes	do.	2,970	3,000	3,000	[e]3,000	2,700
Hematoid	do.	14,964	15,000	15,000	[3]6,825	9,089
Other ornamental	do.	6,397	6,500	6,500	[3]4,925	[e]5,000
Rose quartz	do.	139,645	10,500	50,000	[3]77,980	360,290
Smelting	do.	1,058,000	1,334,000	1,000,000	[e]1,000,000	[e]1,000,000

See footnotes at end of table.

TABLE 3—Continued

MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986[e]	1987[p]	1988
INDUSTRIAL MINERALS—Continued						
Ornamental stones—Continued						
Tourmaline	kilograms	26,558	1,100	1,000	[r]276	520
Quartz, piezoelectric	do.	145	150	150	[e]150	153
Salt, marine[e]		30,000	30,000	30,000	30,000	30,000
Stone:						
Calcite, industrial[e]		2,000	2,000	2,000	2,000	2,000
Dimension, marble, other[e]		2,500	3,000	3,000	3,000	3,000
Marble, cipoline		113	35	110	[r]5	4
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Distillate fuel oil	thousand 42-gallon barrels	129	598	600	[e]600	[e]600
Gasoline	do.	87	454	450	[e]450	[e]450
Kerosene and jet fuel	do.	49	304	300	[e]300	[e]300
Other	do.	2	30	30	[e]30	[e]30
Residual fuel oil	do.	142	729	730	[e]730	[e]730
Total	**do.**	**409**	**2,115**	**2,110**	**[e]2,110**	**[e]2,110**

[e] Estimated. [p] Preliminary.

[1] Table includes data available through June 29, 1989.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, stone) presumably are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[r] Revised figure.

shallow-water alluvial gold prospects in northeastern Madagascar.

Additionally, BRGM signed a contract with OMNIS in September 1988 for the exploration, mining, and sales of platinum-group metals, chromite, and sulfide minerals in the gold-bearing Andriamena district. After review of the exploration data, the deposits appeared to be too low grade and might not be economically minable.

Titanium.—The Canadian firm QIT-Fer et Titane Inc., a subsidiary of RTZ's BP Minerals and OMNIS, had formed the joint-venture company QIT-Madagascar Minerals to exploit the ilmenite sands near Toalagnaro (formerly Fort Dauphin). The scheme was owned 49% by QIT and 51% by OMNIS. Reserves at yearend were estimated at 75 million metric tons. The deposit represented one of the largest ilmenite sources in the world, considerably greater than the estimated reserve base of 45.4 million metric tons in Australia, the world's largest titanium producer. The project had the potential to be the greatest revenue-generating mining venture in Malagasy history. The ilmenite sands were to be dredged from a coastal lagoon 8 kilometers east of Toalagnaro with the ilmenite being separated from the other minerals by an electrostatic and electromagnetic process. QIT planned for production to commence in 1992 or 1993 with the mine eventually producing 625,000 metric tons per year to supply its Sorel, Quebec, smelter. The smelter operation planned to use the concentrate to produce a 90% titanium dioxide slag for use in the manufacture of pigments. QIT was aiming at eventually supplying approximately 15% of the world market for titanium from this deposit. Pilot plant work on wet gravity concentration of the sands produced bulk samples of heavy mineral concentrates. Equipment for the pilot plant was supplied by Mineral Deposits Ltd. of Australia.

Industrial Minerals.—Madagascar remained an important producer of graphite. Although production was small by world standards, the graphite produced was a special high quality, crystalline flake product. Total mined graphite production for 1988, in both flakes and fines, was 14,106 metric tons, from five private operators: Etablissements Gallois, Societe Miniere de la Grande Ile, Izouard, Rostaing, and A. Louys.

Mineral Fuels.—Discovery of do-

TABLE 4

MADAGASCAR: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Destinations, 1986	
			United States	Other (principal)
METALS				
Chromium:				
Ore and concentrate	27,277	35,096	—	India 18,596; China 16,500.
Oxides and hydroxides	2	—		
Copper: Metal including alloys:				
Scrap	13	56	—	Belgium-Luxembourg 37; West Germany 19.
Unwrought	272	—		
Semimanufactures	(2)	19	—	All to Spain.
Iron and steel: Metal:				
Ferroalloys, ferromanganese: value, thousands	—	$1	—	All to France.
Steel, primary forms: do	$1	—		
Semimanufactures:				
Bars, rods, angles, shapes, sections	1	1	—	Mainly to Switzerland.
Universals, plates, sheets	126	1	—	Mainly to Mauritius.
Hoop and strip	14	2	—	Mainly to West Germany.
Wire: value, thousands	$1	$1	NA	NA.
Tubes, pipes, fittings	(2)	4	—	Reunion 3.
Lead: Metal including alloys, scrap	10	—		
Tungsten: Metal including alloys, all forms	2	1	—	All to Japan.
Zinc: Metal including alloys, semimanufactures	(2)	12	12	
Other: Ores and concentrates	76,211	95,152	—	Japan 95,148.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones: value, thousands	—	$1	—	All to Reunion.
Cement	13	31	—	All to Mauritius.
Fertilizer materials: Manufactured: ammonia: value, thousands	—	$1	NA	NA.
Graphite, natural	16,060	13,771	2,371	United Kingdom 5,979; West Germany 2,176.
Lime	26	—		
Mica:				
Crude including splittings and waste	471	1,209	—	Belgium-Luxembourg 1,053; France 156.
Worked including agglomerated splittings	1	2	—	Mainly to West Germany.
Precious and semiprecious stones other than diamond: Natural: value, thousands	$1,002	$1,267	$30	West Germany $829; Japan $162.
Salt and brine	11,216	9,254	—	Greece 2,793; France 2,727; Spain 1,453.
Sodium compounds, n.e.s.: Carbonate, manufactured	4	—		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	9	—		

See footnotes at end of table.

TABLE 4—Continued

MADAGASCAR: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	Destinations, 1986	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Dimension stone—Continued					
Worked		—	1	—	All to Reunion.
Quartz and quartzite		523	136	—	West Germany 133.
Sand other than metal-bearing		110	36	—	All to Australia.
Sulfur, Sulfuric acid	value, thousands	$8	$3	—	All to France.
Other, Crude		—	665	—	Mainly to Japan.
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products					
Gasoline, motor	42-gallon barrels	5,542	230	—	Comoros 77; unspecified 102.
Kerosene and jet fuel	do.	11,749	35,929	—	France 9,617; U.S.S.R. 6,541; Reunion 3,581.
Distillate fuel oil	do.	71,004	23,081	—	Yugoslavia 1,156; unspecified 21,380.
Lubricants	do.	213,423	3,850	—	Mainly for bunkers.
Residual fuel oil	do.	81,265	201,398	—	Singapore 186,227; France 8,205.

NA Not available.
[1] Table prepared by Virginia A. Woodson.
[2] Unreported quantity valued at $2,000.
[3] Unreported quantity valued at $1,594,000.

mestic sources of petroleum were becoming critical for Madagascar during 1988. Payment arrears by the Government caused suspension of an oil importation contract with the U.S.S.R. Madagascar was therefore forced to accept World Bank aid to purchase the remaining oil imports for 1988. Without domestic production of oil, the Government could be faced with fuel shortages in 1989.

OMNIS opened all remaining petroleum tracts for bidding in 1988 with contracts that covered onshore tracts of an average of 10,000 square kilometers and offshore tracts of an average of 15,000 square kilometers. OMNIS offered two types of contracts for the petroleum acreage. The first type of contract was based on the Petroleum Regulations of 1980 and covered all concessions to date. It provided for equity ventures between the foreign oil company (49%) and OMNIS (51%) to cover cost and production sharing with income tax payments and royalties based on achieved rates of return. The second type of contract was a risk service contract in which the foreign oil company assumed all exploration and exploitation costs and would recoup costs through a royalty on production of 10% to 20% for a crude oil discovery and 5% to 20% for a natural gas discovery. During the year, Shell Oil was the first foreign company to respond to the call for exploration under three risk service contracts. Total acreage for the contracts was approximately 54,000 square kilometers. Shell Oil was to spend $42 million to explore the acreage.

Petro-Canada International Assistance Corp. (PCIAC) announced Madagascar's first potentially commercial hydrocarbon find in January 1988. Drilling was in cooperation with OMNIS on tracts abandoned by AMOCO in the onshore Morondava Basin. Located approximately 320 kilometers west of Antananarivo, the West Manambolo-1 well tested gas at a depth of 5,399 feet with production of 9.5 million cubic feet per day, and at a depth of 5,824 feet with production of 6.3 million cubic feet per day. Petro-Canada capped the well as a potential producer. Furthermore, Petro-Canada stated that the majority of the 65 exploratory wells drilled in the Morondava Basin and adjacent basin structures sought hydrocarbon evidence from deeper Carboniferous and Jurassic sediments than the Cretaceous strata of the West Manambolo-1 discovery. This would be a positive sign for additional prospects in the 100,000-square-kilometer onshore area.

Madagascar's only refinery, the Tamatave Solima Petroleum Refinery, produced an estimated 2.1 million barrels of

TABLE 5

MADAGASCAR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	Sources, 1986	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals		—	2	—	All from France.
Aluminum:					
Ore and concentrate		9	—		
Oxides and hydroxides		—	12	—	All from France.
Metal including alloys:					
Scrap		9	—		
Semimanufactures		311	196	4	France 55; Austria 53; Italy 38.
Chromium: Oxides and hydroxides		24	—		
Cobalt: Oxides and hydroxides	value, thousands	—	$1	—	All from West Germany.
Copper: Metal including alloys, semimanufactures		54	31	(2)	France 24; Japan 3.
Iron and steel: Metal:					
Pig iron; cast iron; related materials	value, thousands	$472	$567	—	All from France.
Ferroalloys, ferromanganese		95	90	—	West Germany 70; France 20.
Steel, primary forms	value, thousands	—	$3	—	All from Belgium-Luxembourg.
Semimanufactures:					
Bars, rods, angles, shapes, sections		4,754	6,612	6	France 4,028; Mozambique 524.
Universals, plates, sheets		9,952	6,072	19	France 4,656; Japan 671.
Hoop and strip		81	77	—	Italy 49; France 24.
Rails and accessories		2	1,202	—	France 1,199.
Wire		2,014	777	22	France 402; Mauritius 234.
Tubes, pipes, fittings		970	2,797	1,734	France 734.
Lead:					
Oxides		10	62	—	France 57; United Kingdom 5.
Metal including alloys:					
Scrap		2	—		
Unwrought		257	1	—	All from France.
Semimanufactures	value, thousands	$21	$85	—	Do.
Magnesium: Metal including alloys:					
Scrap	do.	—	$4	$4	
Semimanufactures		—	1	—	All from France.
Manganese:					
Ore and concentrate, metallurgical-grade		2	145	—	Gabon 144.
Oxides		90	30	—	All from West Germany.
Mercury	value, thousands	$7	$2	—	West Germany $1; Norway $1.
Nickel: Metal including alloys, semimanufactures	do.	$6	$9	—	Japan $7.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	do.	$1	$3	—	All from Italy.
Silver: Metal including alloys, unwrought and partly wrought	do.	$1	$2	—	Mainly from Italy.

See footnotes at end of table.

TABLE 5—Continued

MADAGASCAR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	Sources, 1986	
				United States	Other (principal)
METALS—Continued					
Tin: Metal including alloys:					
Scrap	value, thousands	—	$2	—	All from Japan.
Semimanufactures		1	1	—	Do.
Titanium: Oxides		3	19	—	France 17; West Germany 2.
Zinc:					
Ore and concentrate		445	99	—	All from China.
Oxides		—	5	—	West Germany 4; France 1.
Metal including alloys:					
Scrap		—	1	—	All from France.
Semimanufactures		25	10	—	France 9.
Other:					
Oxides and hydroxides		130	504	—	France 503.
Base metals including alloys, all forms		—	2	—	All from France.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$27	$125	$125	
Artificial: Corundum		88	—		
Dust and powder of precious and semiprecious stones including diamond	value, thousands	$4	$1	NA	NA.
Grinding and polishing wheels and stones		147	24	—	France 10; Italy 6.
Asbestos, crude		2,099	348	NA	NA.
Boron materials: Crude natural borates	value, thousands	$39	$11	—	All from France.
Cement		67,111	29,221	1,613	U.S.S.R. 9,915; Republic of South Africa 4,531.
Chalk		—	793	793	
Clays, crude		10	136	—	All from France.
Diatomite and other infusorial earth		44	1	—	Do.
Feldspar, fluorspar, related materials		72	—		
Fertilizer materials:					
Crude, n.e.s.	value, thousands	$1	—		
Manufactured:					
Ammonia		29	28	—	Belgium-Luxembourg 25; West Germany 3.
Nitrogenous		10,063	2,475	—	Netherlands 2,000; France 320.
Phosphatic		4,204	2,520	—	Spain 2,000; Belgium-Luxembourg 520.
Potassic		2,529	1,216	—	France 784; Belgium-Luxembourg 431.
Unspecified and mixed		4,396	8,558	—	Norway 8,550.
Graphite, natural		—	3	—	All from France.
Gypsum and plaster		5,491	4,001	—	Do.

See footnotes at end of table.

TABLE 5—Continued

MADAGASCAR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	Sources, 1986	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Lime	258	2	NA	NA.
Magnesium compounds	—	7	5	West Germany 2.
Mica:				
Crude including splittings and waste	7	—		
Worked including agglomerated splittings	1	3	—	Japan 2; United Kingdom 1.
Pigments, mineral: Iron oxides and hydroxides, processed	18	—		
Precious and semiprecious stones other than diamond: Natural value, thousands	$1	$1	—	All from Japan.
Salt and brine	(2)	12	—	France 10.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	513	133	—	West Germany 130.
Sulfate, manufactured	2,705	1,385	—	Spain 599; France 457.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1	—		
Worked value, thousands	—	$1	NA	NA.
Gravel and crushed rock	—	2	—	Mainly from France.
Quartz and quartzite	3	11	—	All from France.
Sand other than metal-bearing	3	1	—	All from Netherlands.
Sulfur:				
Elemental: Crude including native and byproduct	—	120	—	All from West Germany.
Sulfuric acid	173	122	15	France 74; Netherlands 31.
Talc, steatite, soapstone, pyrophyllite	14	15	—	All from United Kingdom.
Other: Crude	319	—		
MINERAL FUELS AND RELATED MINERALS				
Asphalt and bitumen, natural	—	1,900	—	All from Singapore.
Carbon black	137	50	—	West Germany 48.
Coal	—	2,884	—	All from Mozambique.
Coke and semicoke	—	11,239	NA	Mozambique 2,000; unspecified 9,105.
Peat including briquets and litter	4,303	—		
Petroleum:				
Crude thousand 42-gallon barrels	1,443	7	—	All from France.
Refinery products:				
Liquefied petroleum gas do.	10	29	NA	Greece 6; Malaysia 4; unspecified 19.
Gasoline, motor do.	617	1,488	—	U.S.S.R. 980; unspecified 263.
Mineral jelly and wax do.	40	4	—	Hong Kong 3; Netherlands 1.
Kerosene and jet fuel do.	154	414	—	Bahrain 97; Yemen (Aden) 71; unspecified 163.
Distillate fuel oil do.	392	1,074	4	U.S.S.R. 331; United Arab Emirates 157; Bahrain 155.
Lubricants do.	53	39	1	France 2; unspecified 35.
Residual fuel oil do.	5	310	NA	Singapore 116; unspecified 194.
Bitumen and other residues do.	1	(2)	—	Mainly from France.

NA Not available.

[1] Table prepared by Virginia A. Woodson.

[2] Less than 1/2 unit.

refined gasoline and fuel oils during the year. Total production capacity for the refinery was 2.5 million barrels.

MAURITIUS[7]

Mauritius remained a modest producer of salt and quarry products including limestone and basalt. The country's economy continued to show robust growth as the GDP rose by 7.8% in 1988 over that of 1987. Mauritius's balance of payments became positive in 1985 and posted surpluses of $217 million in 1987 and $95 million in 1988.[8] The country's debt-service ratio declined from 27% in 1985 to 12.4% in 1988. The country's manufacturing sector continued to grow, comprising 25% of the GDP in 1988. Exports of sugar, consumer durables, and textiles were the country's mainstays in foreign trade. Needed mineral fuels and raw materials were imported. The Government planned an environmental protection project that would entail the creation of an industrial park, which would concentrate all of the island's polluting industries. A sewage and water treatment facility would treat the water from the park and the country's hotels.

REUNION[9]

Mineral activities in Réunion centered primarily on the operation of a 200,000-ton-per-year cement clinker grinding plant at Saint-Deins, which manufactured cement mix from imported materials. In addition, there were a number of small sand and gravel operations that supported local construction.

SEYCHELLES[10]

The only mineral-related operations on the islands of Seychelles continued to be small sand and gravel pits for local construction, and the collection and processing of guano for fertilizer.

SOMALIA[11]

Sepiolite (meerschaum) continued to be the only mineral produced for export. A major sepiolite deposit was evaluated by the United Nations Development Program (UNPD). Reserves were estimated to be 10 million tons. The decision to undertake production was expected in 1989. Other mineral production in 1988 included cement from the plant at Berbera that used limestone from local quarries, solar salt

TABLE 6

MAURITIUS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1984	1985	1986	1987[p]	1988[e]
Lime[e]	7,000	7,000	7,000	7,000	7,000
Salt[e]	6,000	6,000	6,000	6,000	6,000
Stone: Basalt, not further described[e]	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000

[e]Estimated. [p]Preliminary.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

TABLE 7

SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1984	1985	1986	1987[p]	1988[e]
Phosphate minerals, guano[e]	4,500	4,500	4,500	4,500	4,500

[e]Estimated. [p]Preliminary.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

produced from the evaporation of sea water, and a small amount of tin.

The New India Mining Corp. of India signed a 1-year agreement to prospect for minerals in the Togdheer region and in the Shaykh, Berbera, and Gabiey districts in the northwest.

International oil companies, including Amoco, Chevron, Conoco, and Shell, continued their activities in petroleum exploration in 1988. Chevron's first test well southeast of Zeila, in the northwest corner of Somalia began in early 1988. Shell was drilling at its site near Bardera in southwest Somalia. Amoco Somalia Petroleum Co. commenced exploration on 1.4 million hectares near the capital of Mogadishu. The Government also continued to operate the Iraqsoma petroleum refinery near Mogadishu.

Somalia is one of the world's least developed countries and has few known resources. Agriculture was the most important sector of the economy and accounted for about 50% of GDP. The small industrial sector was based on the processing of agricultural products and accounted for less than 10% of GDP. Attempts by the Government to diversify the agriculture economy have met with limited success. Somalia was well positioned geographically for international trade with the deep-water ports Berbera, Kismayo, and Mogadishu. However, economic progress was expected to be slow, considering the country's marginally developed infrastructure and high debt levels. Also, domestic problems with insurgents and border conflicts with Ethiopia were expected to further slow economic development.

SUDAN[12]

Sudan's metallic mining operations extracted modest amounts of chromite, gold, and manganese. The country also produced small amounts of industrial minerals. Gold continued to be the most lucrative aspect of the mineral industry. Sudan's Gebeit gold mine, jointly owned and operated by Minex Minerals Ltd., a subsidiary of Greenwich Resources Ltd. of the United Kingdom and the Sudanese Government, expected to produce about 36,000 troy ounces of gold in 1988. However, during the year, Gebeit's rich Wadi deposit was determined to be discontinuous, which resulted in a significant grade and output reduction. The operation was to have supplemented its reduced output by processing mine tailings, and, reportedly, the actual output at yearend was about 7,500 troy ounces. New exploratory studies were to be conducted to determine the true scope of the reserves.

The nearby Aberketeib Mine, closed for 20 years, was reopened by Kenmare Resources PLC of Dublin, Ireland. Kenmare reached an agreement with Sudan's Central Desert Mining Co. to acquire a 49% share in the mine and a surrounding 2-square-kilometer mining lease. The operation was incorporated in the Sudan as the Bashken Mining Co. Ltd. In 1988, having taken tailings volume measurements and samples for testing, Kenmare found the amalgamation and cyanidation tailings resources to total 28,130 tons with an average grade of 0.24 troy ounce of gold per metric ton. The company anticipated a

TABLE 8

SOMALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1984	1985	1986	1987[p]	1988[e]
Nitrogen: Ammonia, N content	26	26	15	10	–
Petroleum refinery products:					
Gasoline, motor thousand 42-gallon barrels	247	665	682	725	700
Jet fuel do.	200	160	152	168	160
Kerosene do.	93	93	77	70	80
Distillate fuel oil do.	522	522	537	612	600
Residual fuel oil do.	107	100	107	93	100
Other[3] do.	182	189	301	259	260
Total, includes refinery fuel and losses do.	**1,351**	**1,729**	**1,856**	**1,927**	**1,900**
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Sepiolite, meerschaum[e]	10	10	10	10	10

[e] Estimated. [p] Preliminary.

[1] Includes data available through Feb. 20, 1990.

[2] In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3] Includes refinery fuel and losses through 1985. Starting with 1986, refinery fuel and losses are included in output of individual products.

TABLE 9

SUDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
Cement, hydraulic	thousand tons	176	193	200	122	175
Chromium: Chromite ore and concentrate, gross weight		20,000	8,799	8,500	13,015	[3]8,000
Gold, mine output, Au content[e]	troy ounces	1,500	1,500	1,600	2,734	[3]16,075
Gypsum and anhydrite, crude[e]		8,000	6,400	7,000	7,000	[3]5,000
Mica, all grades[e]		10	10	10	10	10
Petroleum refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	NA	NA	NA	NA	[3]101
Gasoline	do.	772	1,000	1,000	1,000	[3]1,275
Jet fuel	do.	334	300	300	300	[3]669
Kerosene	do.	NA	NA	NA	NA	[3]128
Distillate fuel oil	do.	1,438	1,500	1,500	1,500	[3]2,026
Residual fuel oil	do.	1,690	1,500	1,500	1,500	[3]1,573
Other,[4]	do.	260	300	300	300	[3]208
Total including refinery fuel and loss[e]	**do.**	**4,394**	**4,600**	**4,600**	**4,600**	**5,980**
Salt		75,000	38,467	40,000	51,662	[3]150,000

[e]Estimated. [p]Preliminary.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Includes refinery fuel and losses through 1985. Starting in 1986, refinery fuel and losses are included in output of individual products.

recovery rate of 75%, utilizing a Kenmare-designed vat leaching process and a Merill Crowe gold precipitating system. Thus, over 5,000 troy ounces would be recovered. Kenmare would initially recover the gold from the old tailings heaps while simultaneously conducting exploration on the surrounding property.

After the exhaustion of the tailings, underground mining would be resumed with the addition of a primary crusher. Preliminary test results indicated that the mine would yield an ore grade of about 0.45 troy ounce of gold per metric ton.

BRGM of France reported the production of about 32,000 troy ounces of gold at the Hassai pilot plant in the Nubian Desert. The pilot plant reportedly reached its design capacity during the year. Gold reserves at the Hassai were estimated to be 200,000 troy ounces. Under the provisions of an agreement with the Sudanese Government, BRGM was to have 100% ownership of the mine and be responsible for its operation.

At yearend, Sudan reported the discovery of copper, chromite, manganese, phosphate, and uranium resources in the Nuba mountains. Exploration work was done by Sudan's Public Corp. of Geological Studies in collaboration with the Federal Republic of Germany. In November, the Chevron Petroleum Corp. announced the resumption of oil drilling operations, for which security was provided by Sudan's military forces, in the Muglad area.

TANZANIA[13]

The Tanzanian economy was heavily dependent upon agriculture, which accounted for about 40% of GDP, provided 85% of exports and employed 90% of the workforce. Recurring drought deterred economic performance by reducing food production and increasing the amount of imports. However, real economic activity rose for the third straight year and most sectors experienced growth in 1988. Industry accounted for about 10% of GDP and was limited to processing farm products and light consumer goods. The 3-year economic recovery program announced in mid-1986 had produced some positive results. Most

notable were a currency devaluation of 4.8% in June 1988 and a further devaluation of 21% in November 1988, incentives for private investment, reduction in the inflation rate, and a willingness of the World Bank and the International Monetary Fund to provide credits. The total cost of the 3-year program was estimated to be $3 billion.[14]

Tanzania has varied mineral resources; however, lack of capital, a skilled workforce, and equipment hinders the Government's ability to exploit these resources. Mineral and petroleum exploration were two areas the Government had targeted for foreign investment. On the local level, miners were encouraged to create co-operatives to enable them to obtain loans for the purchase of small-scale mining equipment.

Gold was mostly mined by small operators and often was smuggled out of the country. The Kahama district was believed to contain significant gold mineralization owing to its location within a known gold belt that extended

TABLE 10

TANZANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
Cement, hydraulic		370,000	301,000	300,000	300,000	[3]189,390
Clays:						
Bentonite[e]		[3]75	75	75	75	75
Kaolin		1,885	1,636	1,600	1,446	[3]528
Coal, bituminous		9,722	20,000	20,000	2,860	[3]3,349
Diamond[4]	carats	277,352	236,000	190,000	150,000	150,000
Gem stones, precious and semiprecious, excluding diamond[e, 5]	kilograms	650	[3]646	650	4,400	9,400
Gold, refined	troy ounces	2,680	1,776	2,735	6,466	[3]1,672
Gypsum and anhydrite, crude		[e]12,000	14,411	[e]14,000	24,648	[3]19,570
Lime, calcined and hydrated[e]		3,000	[3]2,472	3,000	3,000	3,000
Limestone, crushed		NA	NA	NA	680,701	792,454
Mica, sheet		(6)	(6)	(6)	(6)	(6)
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	63	80	80	44	73
Gasoline	do.	892	800	800	909	784
Kerosene	do.	259	220	220	330	325
Jet fuel	do.	213	300	300	220	232
Distillate fuel oil	do.	1,062	1,050	1,050	1,069	1,088
Residual fuel oil	do.	1,904	1,750	1,750	525	1,771
Other	do.	330	300	300	540	320
Total including refinery fuel and losses[e]	**do.**	**[3]4,723**	**4,500**	**4,500**	**3,600**	**4,600**
Phosphate minerals: Apatite		14,536	15,000	10,000	18,386	[3]4,466
Salt, all types		21,659	21,108	21,868	41,123	[3]19,777
Salt, glass		NA	NA	NA	6,071	[3]12,043
Soda ash[e]		298	300	300	300	300
Tin, mine output, Sn content[e]		4	2	2	2	2

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Diamond figures are estimated to represent 70% gem-quality or semigem-quality and 30% industrial-quality stones.

[5]Exports.

westerly from northeastern Tanzania to the western side of Lake Victoria. The Kahama Gold Mining Co., a joint venture owned by the Government and three Finnish firms, prospected this area in 1988. It was reported that drilling indicated estimated reserves of more than 4 million tons of ore averaging 0.03 troy ounce of gold per ton. The Buckreef gold mine in the Geita district was undergoing a technical evaluation that consisted of ore reserve determination, exploration drilling requirements, and a review of mining operations. If the evaluation showed the mine to be economically viable, then a detailed study of overall technical and financial viability would be performed. Exploration was also underway in the northwestern Siga Hills where preliminary investigations had indicated a potential for gold mineralization.

The Government of Tanzania was seeking financial and technical assistance for exploration and development of the Linganga iron ore deposits in the Kipengere mountains of the Iringa region. The Linganga deposits were estimated to contain 45 million tons of ore with an average grade of 51% iron, 13% titanium, and 0.6% vanadium. The country's iron and steel requirement was around 500,000 tons per year with only 30,000 tons per year produced in the country, at steel mills in Tanga and Dar-es-Salaam. The Government's planned development of a mining complex would meet the domestic demand and provide material for export. However, the estimated cost of $350 million to develop the complex and required infrastructure was likely to require foreign investment.

Tanzania's first major coal mine commenced operations at yearend. The Kiwira Mine is at Songe-Kiwira in the southern region of Mbeya. It will be operated by Kiwira Coal Mining Co., a subsidiary of State Mining Co. (STAMICO). The initial output of 93,000 tons per year would be used mostly to satisfy local demands. This would significantly reduce the country's oil imports. The project's estimated cost was almost $50 million and was estimated to have 65 years of reserves.

The Williamson Diamond Mines Co.'s Mwadui Mine was to undergo a modernization program to rehabilitate the treatment plant, at a cost of $5 million. The company was jointly owned by STAMINCO and Willcroft Ltd. (Canada). Diamond reserves at the Williamson Mine have been estimated at almost 3.9 million carats. This was considered sufficient for 10 years of operation at current production rates. Gulf Exploration and Mining Co. was exploring for gem stones at Umba in the Tenga region, and Mayote Ltd., Thailand, had gem stone exploration underway at Ifakari-Matombo in the Morogoro region. The Minjingu deposit remained the only active phosphate mine in 1988. The open pit mine was operated by STAMINCO with Kone Corp. of Finland being responsible for engineering and design.

American and other foreign firms continued exploration for natural gas reserves in addition to the Songa Songa Gasfield off the southern coast of Tanzania, although results obtained were not promising. However, Tanzania was considered to be geologically favorable for large deposits of natural gas.

UGANDA[15]

Uganda's economy showed some signs of recovery in 1988, and the steel industry registered impressive results, increasing production by 82% over that of 1987. The growth in the steel industry was attributed largely to the startup of a new rolling mill at Jinja, as well as the resumption of output by plants producing roofing materials and iron sheets.

The reconstruction of the second line of Uganda's cement plant at Hima

TABLE 11

UGANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1984	1985	1986	1987[p]	1988[e]
Cement, hydraulic[e]	20,000	20,000	20,000	20,000	20,000
Lime, hydrated and quick[e]	500	500	500	500	500
Phosphate minerals: Apatite[e]	100	100	100	100	100
Salt, evaporated[e]	5,000	5,000	5,000	5,000	5,000
Tin, mine output, Sn content[e]	18	18	18	10	10
Tungsten, mine output, W content[e]	4	4	4	4	4

[e]Estimated. [p]Preliminary.

[1]Includes data available through Feb. 20, 1990.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

began in November with assistance from the Federal Republic of Germany. The installation work was to be done largely by Ugandan engineers; upon completion, the plant would produce about 600 tons of cement per day. The Kilembe copper mine remained on a care-and maintenance basis throughout the year.

In September, France and Uganda discussed plans to assess the possibility of processing slags stockpiled at Kasese, the partial rehabilitation of the Kilembe Mine, and the exploration for gold in Uganda.

[1]Prepared by Harold R. Newman and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[2]Prepared by George A. Rabchevsky and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[3]Prepared by George A. Rabchevsky and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[4]Prepared by John G. Panulas and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[5]Prepared by Thomas P. Dolley, physical scientist, Division of International Minerals.

[6]Where necessary, values have been converted from Madagascar francs (FMG) to U.S. dollars at the rate of FMG1,407.1 = US$1.00.

[7]Prepared by Walter G. Steblez, foreign mineral specialist, and Lloyd E. Antonides, physical scientist, Division of International Minerals.

[8]Where necessary, values have been converted from rupees(R) to U.S. dollars at the rate of R12.878 = US$1.00 for 1987, and R13.438 = US$1.00 for 1988.

[9]Prepared by John G. Panulas and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[10]Prepared by John G. Panulas and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[11]Prepared by Harold R. Newman and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[12]Prepared by Walter G. Steblez, foreign mineral specialist, and Lloyd E. Antonides, physical scientist, Division of International Minerals.

[13]Prepared by Harold R. Newman and Lloyd E. Antonides, physical scientists, Division of International Minerals.

[14]Where necessary, values have been converted from Tanzania shillings (s) to U.S. dollars at the rate of S99.292 = US$1.00.

[15]Prepared by Walter G. Steblez, foreign mineral specialist, and Lloyd E. Antonides, physical scientist, Division of International Minerals.